

Syllabus

[cmcd.economia@fgv.br]

Course Name: Environmental Economics

Faculty:

Teaching Assistants:

2026 FIRST SEMESTER

COURSE OUTLINE

This graduate-level course in Environmental Economics aims to provide students with a comprehensive understanding of contemporary issues in the field. Through a multidisciplinary approach, we will explore topics at the intersection of economics and natural sciences, emphasizing the application of diverse methodologies – e.g., IV, difference-in-differences, structural models, integrated assessment models, predictive models -- and types of data -- e.g., cross-section, panel, geospatial, time series. The course will also foster the development of critical scientific reading (including non-econ journals), comprehension, and presentation skills, culminating in the formulation of an independent research idea.

COURSE PROGRAM

- Global warming
- Renewables
- Deforestation
- Biodiversity
- Artic melting
- Sea level rise
- Environmental justice
- Pollution
- Water Markets

BIBLIOGRAPHY

Global warming

- Jaeger, W. K., Irwin, E. G., Fenichel, E. P., Levin, S., & Herziger, A. (2023). Meeting the Challenges to Economists of Pursuing Interdisciplinary Research on Human–Natural Systems. *Review of Environmental Economics and Policy*, 17(1), 43-63.
- Hsiang, S., & Kopp, R. E. (2018). An economist's guide to climate change science. *Journal of Economic Perspectives*, 32(4), 3-32.
- Manabe, S., & Wetherald, R. T. (1967). Thermal equilibrium of the atmosphere with a given distribution of relative humidity.
- Keeling, C. D., Bacastow, R. B., Bainbridge, A. E., Ekdahl Jr, C. A., Guenther, P. R., Waterman, L. S., & Chin, J. F. (1976). Atmospheric carbon dioxide variations at Mauna Loa observatory, Hawaii. *Tellus*, 28(6), 538-551.

- ***Nordhaus, W. D. (1992). An optimal transition path for controlling greenhouse gases. *Science*, 258(5086), 1315-1319.**
- Nordhaus, W. D. (1991). To slow or not to slow: the economics of the greenhouse effect. *The economic journal*, 101(407), 920-937.
- Nordhaus, W. (2019). Climate change: The ultimate challenge for economics. *American Economic Review*, 109(6), 1991-2014.
- Tol, R. S. (2023). Social cost of carbon estimates have increased over time. *Nature Climate Change*, 1-5.
- Duarte, P. G. (2016). A path through the wilderness: Time discounting in growth models. *History of Political Economy*, 48(2), 265-306.
- Schlenker, W., & Roberts, M. J. (2009). Nonlinear temperature effects indicate severe damages to US crop yields under climate change. *Proceedings of the National Academy of sciences*, 106(37), 15594-15598.
- Dell, M., Jones, B. F., & Olken, B. A. (2012). Temperature shocks and economic growth: Evidence from the last half century. *American Economic Journal: Macroeconomics*, 4(3), 66-95.
- Dell, M., Jones, B. F., & Olken, B. A. (2009). Temperature and income: reconciling new cross-sectional and panel estimates. *American Economic Review*, 99(2), 198-204.
- Burke, M., Hsiang, S. M., & Miguel, E. (2015). Global non-linear effect of temperature on economic production. *Nature*, 527(7577), 235-239.
- Park, R. J., Goodman, J., Hurwitz, M., & Smith, J. (2020). Heat and learning. *American Economic Journal: Economic Policy*, 12(2), 306-339.
- Skidmore, M. E. (2023). Outsourcing the dry season: Cattle ranchers' responses to weather shocks in the Brazilian Amazon. *American Journal of Agricultural Economics*, 105(2), 409-433.
- Barreca, A., Clay, K., Deschenes, O., Greenstone, M., & Shapiro, J. S. (2016). Adapting to climate change: The remarkable decline in the US temperature-mortality relationship over the twentieth century. *Journal of Political Economy*, 124(1), 105-159.
- Dietz, S., van der Ploeg, F., Rezaei, A., & Venmans, F. (2021). Are economists getting climate dynamics right and does it matter? *Journal of the Association of Environmental and Resource Economists*, 8(5), 895-921.
- Cai, Y., Judd, K. L., Lenton, T. M., Lontzek, T. S., & Narita, D. (2015). Environmental tipping points significantly affect the cost– benefit assessment of climate policies. *Proceedings of the National Academy of Sciences*, 112(15), 4606-4611.

Renewables

- ***Gonzales, L. E., Ito, K., & Reguant, M. (2023). The Investment Effects of Market Integration: Evidence From Renewable Energy Expansion in Chile. *Econometrica*, 91(5), 1659-1693.**
- Neidell, M., Uchida, S., & Veronesi, M. (2021). The unintended effects from halting nuclear power production: Evidence from Fukushima Daiichi accident. *Journal of Health Economics*, 79, 102507.
- Novan, Kevin. 2015. "Valuing the Wind: Renewable Energy Policies and Air Pollution Avoided." *American Economic Journal: Economic Policy*, 7 (3): 291-326.
- Cullen, Joseph. 2013. "Measuring the Environmental Benefits of Wind-Generated Electricity." *American Economic Journal: Economic Policy*, 5 (4): 107-33.

Deforestation

- Jayachandran S, De Laat J, Lambin EF, Stanton CY, Audy R, Thomas NE. 2017. Cash for carbon: a randomized trial of payments for ecosystem services to reduce deforestation. *Science* 357(6348):267–73
- ***Assunção, J., Gandour, C., & Rocha, R. (2023). DETER-ing Deforestation in the Amazon: Environmental Monitoring and Law Enforcement. *American Economic Journal: Applied Economics*, 15(2), 125-156.**
- Cai, Y., Judd, K. L., Lenton, T. M., Lontzek, T. S., & Narita, D. (2015). Environmental tipping points significantly affect the cost– benefit assessment of climate policies. *Proceedings of the National Academy of Sciences*, 112(15), 4606-4611.

- Boulton, C. A., Lenton, T. M., & Boers, N. (2022). Pronounced loss of Amazon rainforest resilience since the early 2000s. *Nature Climate Change*, 12(3), 271-278.
- Fetzer, T., & Marden, S. (2017). Take what you can: property rights, contestability and conflict. *The Economic Journal*, 127(601), 757-783.
- Bragança, A., & Dahis, R. (2022). Cutting special interests by the roots: Evidence from the Brazilian Amazon. *Journal of Public Economics*, 215, 104753
- Verbesselt, J., Umlauf, N., Hirota, M., Holmgren, M., Van Nes, E. H., Herold, M., ... & Scheffer, M. (2016). Remotely sensed resilience of tropical forests. *Nature Climate Change*, 6(11), 1028-1031.
- Assunção J, Gandour C, Rocha R, Rocha R. 2020. The effect of rural credit on deforestation: evidence from the Brazilian Amazon. *Econ. J.* 130(626):290–330
- Hsiao, A. (2021). Coordination and commitment in international climate action: evidence from palm oil. Unpublished, Department of Economics, MIT.
- West, T. A., Wunder, S., Sills, E. O., Börner, J., Rifai, S. W., Neidermeier, A. N., ... & Kontoleon, A. (2023). Action needed to make carbon offsets from forest conservation work for climate change mitigation. *Science*, 381(6660), 873-877.
- West, T. A., Börner, J., Sills, E. O., & Kontoleon, A. (2020). Overstated carbon emission reductions from voluntary REDD+ projects in the Brazilian Amazon. *Proceedings of the National Academy of Sciences*, 117(39), 24188-24194.
- Salati, E., Dall'Olio, A., Matsui, E., & Gat, J. R. (1979). Recycling of water in the Amazon basin: an isotopic study. *Water resources research*, 15(5), 1250-1258.
- Nobre, C. A., Sellers, P. J., & Shukla, J. (1991). Amazonian deforestation and regional climate change. *Journal of climate*, 4(10), 957-988.
- Sampaio, G., Nobre, C., Costa, M. H., Satyamurty, P., Soares-Filho, B. S., & Cardoso, M. (2007). Regional climate change over eastern Amazonia caused by pasture and soybean cropland expansion. *Geophysical Research Letters*, 34(17).

Biodiversity

- ***Frank, E., & Sudarshan, A. (2023). The Social Costs of Keystone Species Collapse: Evidence From The Decline of Vultures in India. Working paper**
- ***Taylor, M. S. (2011). Buffalo hunt: International trade and the virtual extinction of the North American bison. *American Economic Review*, 101(7), 3162-3195.**
- Taylor, M. S., & Weder, R. (2023). *On the Economics of Extinction and Mass Extinctions* (No. w31952). National Bureau of Economic Research.
- Donn L Feir, Rob Gillezeau, Maggie E C Jones, The Slaughter of the Bison and Reversal of Fortunes on the Great Plains, *The Review of Economic Studies*, 2023; rdad060
- Taylor, C. A. (2021). Cicadian rhythm: Insecticides, infant health and long-term outcomes. Working paper
- Frank, E. G., & Wilcove, D. S. (2019). Long delays in banning trade in threatened species. *Science*, 363(6428), 686-688.
- Ferris, A. E., & Frank, E. G. (2021). Labor market impacts of land protection: The Northern Spotted Owl. *Journal of Environmental Economics and Management*, 109, 102480.
- Dasgupta, P. (2021). *The economics of biodiversity: the Dasgupta review*. Hm Treasury.

Ice melting and Sea level rise

- Diebold, F. X., & Rudebusch, G. D. (2022). Probability assessments of an ice-free Arctic: Comparing statistical and climate model projections. *Journal of Econometrics*, 231(2), 520-534.
- ***Diebold, F. X., & Rudebusch, G. D. (2023). Climate models underestimate the sensitivity of Arctic sea ice to carbon emissions. *Energy Economics*, 126, 107012.**
- ***Desmet, Klaus, Robert E. Kopp, Scott A. Kulp, Dávid Krisztián Nagy, Michael Oppenheimer, Esteban Rossi-Hansberg, and Benjamin H. Strauss. 2021. "Evaluating the Economic Cost of Coastal Flooding." *American Economic Journal: Macroeconomics*, 13 (2): 444-86.**
- Chen, J., & Mueller, V. (2018). Coastal climate change, soil salinity and human migration in Bangladesh. *Nature climate change*, 8(11), 981-985.
- Balboni, C. A. (2023). In harm's way? infrastructure investments and the persistence of coastal cities Mimeo, 2023.
- Rahmstorf, S., Box, J. E., Feulner, G., Mann, M. E., Robinson, A., Rutherford, S., & Schaffernicht, E. J. (2015). Exceptional twentieth-century slowdown in Atlantic Ocean overturning circulation. *Nature climate change*, 5(5), 475-480.
- Bekkers, E., Francois, J. F., & Rojas-Romagosa, H. (2018). Melting ice caps and the economic impact of opening the Northern Sea Route. *The Economic Journal*, 128(610), 1095-1127.
- Hsiao, A. (2022). Sea Level Rise and Urban Adaptation in Jakarta. Mimeo, 2022.

Environmental justice

- ***Tanaka, Shinsuke, Kensuke Teshima, and Eric Verhoogen. 2022. "North-South Displacement Effects of Environmental Regulation: The Case of Battery Recycling." *American Economic Review: Insights*, 4 (3): 271-88.**
- Heblich, S., Trew, A., & Zylberberg, Y. (2021). East-side story: Historical pollution and persistent neighborhood sorting. *Journal of Political Economy*, 129(5), 1508-1552.
- Hernandez-Cortes, D., & Meng, K. C. (2023). Do environmental markets cause environmental injustice? Evidence from California's carbon market. *Journal of Public Economics*, 217, 104786.
- Christensen, Peter, Ignacio Sarmiento-Barbieri, and Christopher Timmins. "Housing Discrimination and the Toxics Exposure Gap in the United States: Evidence from the Rental Market." *The Review of Economics and Statistics* (2020): 1-37.
- Curci, F., & Masera, F. (2023). Flight from Urban Blight: Lead Poisoning, Crime, and Suburbanization. *Review of Economics and Statistics*, 1-45.

Pollution

- ***Dias, M., Rocha, R., & Soares, R. R. (2023). Down the River: Glyphosate Use in Agriculture and Birth Outcomes of Surrounding Populations. *Review of Economic Studies*, rdad011.**
- Calzada, J., Gisbert, M., & Moscoso, B. (2023). The hidden cost of bananas: The effects of pesticides on newborns' health. *Journal of the Association of Environmental and Resource Economists*, 10(6), 1623-1663.
- Currie, J., & Walker, R. (2011). Traffic congestion and infant health: Evidence from E-ZPass. *American Economic Journal: Applied Economics*, 3(1), 65-90.
- Rangel, M. A., & Vogl, T. S. (2019). Agricultural fires and health at birth. *Review of Economics and Statistics*, 101(4), 616-630.

- Burke, M., Childs, M. L., de la Cuesta, B., Qiu, M., Li, J., Gould, C. F., ... & Wara, M. (2023). The contribution of wildfire to PM2.5 trends in the USA. *Nature*, 1-6.

Water markets (time allowing)

- ***Rafey, W. (2023). Droughts, deluges, and (river) diversions: Valuing market-based water reallocation. *American Economic Review*, 113(2), 430-471.**

GRADING

30% - [Presentation of one paper](#)

A brief presentation (~15 min) of a paper on environmental economics. Check with me first about the paper you have chosen.

40% - [Presentation of a research idea](#)

The idea is a brief presentation (15~20 minutes) where you will be asked to present something new, related with environmental economics, that interests you. Could be the sketch of a model, a data set, a correlation, a newspaper's article that made you angry. My objective is to provide an environment for the student to receive feedback.

30% - Participation in class

CONTACT

Date	Content	Recommended reading
1	Where are we with environmental economics? Climate Change	-
2	Climate Change	Nordhaus, W. D. (1992). An optimal transition path for controlling greenhouse gases. <i>Science</i>
3	Renewables	Gonzales, L. E., Ito, K., & Reguant, M. (2023). The Investment Effects of Market Integration: Evidence From Renewable Energy Expansion in Chile. <i>Econometrica</i>
4	Deforestation	Assunção, J., Gandour, C., & Rocha, R. (2023). DETER-ing Deforestation in the Amazon: Environmental Monitoring and Law Enforcement. <i>American Economic Journal: Applied Economics</i>
5	Deforestation Biodiversity	Frank, E., & Sudarshan, A. (2023). The Social Costs of Keystone Species Collapse: Evidence from The Decline of Vultures
6	Melting ice in the poles and sea level rise Presentation of a paper	Diebold, F. X., & Rudebusch, G. D. (2023). Climate models underestimate the

		sensitivity of Arctic sea ice to carbon emissions. <i>Energy Economics</i>
7	Melting ice in the poles and sea level rise Presentation of a paper	Desmet, Klaus, Robert E. Kopp, Scott A. Kulp, Dávid Krisztián Nagy, Michael Oppenheimer, Esteban Rossi-Hansberg, and Benjamin H. Strauss. 2021. "Evaluating the Economic Cost of Coastal Flooding." <i>American Economic Journal: Macroeconomics</i>
8	Environmental Justice Presentation of a paper	Tanaka, Shinsuke, Kensuke Teshima, and Eric Verhoogen. 2022. "North-South Displacement Effects of Environmental Regulation: The Case of Battery Recycling." <i>American Economic Review: Insights</i>
9	Environmental Justice Presentation of a paper	-
10	Pollution Presentation of a paper	Heblich, S., Trew, A., & Zylberberg, Y. (2021). East-side story: Historical pollution and persistent neighborhood sorting. <i>Journal of Political Economy</i>
11	Pollution Presentation of a research idea	Dias, M., Rocha, R., & Soares, R. R. (2023). Down the River: Glyphosate Use in Agriculture and Birth Outcomes of Surrounding Populations. <i>Review of Economic Studies</i> , rdad011.
12	Presentation of a research idea	
13	Presentation of a research idea	-
14	Water	Rafey, W. (2023). Droughts, deluges, and (river) diversions: Valuing market-based water reallocation. <i>American Economic Review</i> , 113(2), 430-471.

Suggested papers for presentation:

Dugoua, E. (2023). Induced innovation and international environmental agreements: evidence from the ozone regime. *Review of Economics and Statistics*, 1-45.

Akesaka, M., & Shigeoka, H. (2023). "Invisible Killer": Seasonal Allergies and Accidents (No. w31593). National Bureau of Economic Research.

Jarvis, S., Deschenes, O., & Jha, A. (2022). The private and external costs of Germany's nuclear phase-out. *Journal of the European Economic Association*, 20(3), 1311-1346.

Karp, L., & Traeger, C. (2024). Taxes versus quantities reassessed. *Journal of Environmental Economics and Management*, 102951.

Gazze, L., Persico, C., & Spirovska, S. (2024). The long-run spillover effects of pollution: How exposure to lead affects everyone in the classroom. *Journal of Labor Economics*, 42(2), 357-394.

- Hansen-Lewis, J., & Marcus, M. M. (2022). Uncharted waters: Effects of maritime emission regulation (No. w30181). National Bureau of Economic Research.
- Oliveira, R., & Barreto, Yuri (2024). From Fields to Futures: The Lasting Effects of Crop Diseases on Education and Earnings.
- Ipapa, G. (2024) The Hidden Costs of Recycling: Lead Exposure and Student Learning.
- Cassidy, A., Meeks, R. C., & Moore, M. R. (2023). Cleaning up the Great Lakes: Housing market impacts of removing legacy pollutants. *Journal of Public Economics*, 226, 104979.
- Henneman, L., Choirat, C., Dedoussi, I., Dominici, F., Roberts, J., & Zigler, C. (2023). Mortality risk from United States coal electricity generation. *Science*, 382(6673), 941-946.
- Schlüter, M., Brelsford, C., Ferraro, P. J., Orach, K., Qiu, M., & Smith, M. D. (2023). Unraveling complex causal processes that affect sustainability requires more integration between empirical and modeling approaches. *Proceedings of the National Academy of Sciences*, 120(41), e2215676120.
- Xing, J., Hu, Z., Xia, F., Xu, J., & Zou, E. (2023). Urban forests: Environmental health values and risks (No. w31554). National Bureau of Economic Research.
- Hausman, C., & Stolper, S. (2021). Inequality, information failures, and air pollution. *Journal of Environmental Economics and Management*, 110, 102552.
- Qiu, M., Ratledge, N., Azevedo, I. M., Diffenbaugh, N. S., & Burke, M. (2023). Drought impacts on the electricity system, emissions, and air quality in the western United States. *Proceedings of the National Academy of Sciences*, 120(28), e2300395120.
- Taylor, M. S., & Mayer, F. (2023). International Trade, Noise Pollution, and Killer Whales (No. w31390). National Bureau of Economic Research.
- Taylor, C. A., & Druckenmiller, H. (2022). Wetlands, flooding, and the clean water act. *American Economic Review*, 112(4), 1334-1363.
- Alix-Garcia, J., & Millimet, D. L. (2023). Remotely incorrect? Accounting for nonclassical measurement error in satellite data on deforestation. *Journal of the Association of Environmental and Resource Economists*, 10(5), 1335-1367.
- Young, J. S., & McCarty, T. J. (2023). Adapting network theory for spatial network externalities in agriculture: A case study on hemp cross-pollination. *American Journal of Agricultural Economics*, 105(4), 1267-1287.
- Berazneva, J., & Byker, T. S. (2022). Impacts of Environmental Degradation: Forest, Loss, Malaria, and Child Outcomes in Nigeria. *Review of Economics and Statistics*, 1-46.
- Schlüter, M., Brelsford, C., Ferraro, P. J., Orach, K., Qiu, M., & Smith, M. D. (2023). Unraveling complex causal processes that affect sustainability requires more integration between empirical and modeling approaches. *Proceedings of the National Academy of Sciences*, 120(41), e2215676120.
- Xing, J., Hu, Z., Xia, F., Xu, J., & Zou, E. (2023). Urban forests: Environmental health values and risks (No. w31554). National Bureau of Economic Research.
- Läpple, D., & Osawe, O. W. (2023). Concern for animals, other farmers, or oneself? Assessing farmers' support for a policy to improve animal welfare. *American Journal of Agricultural Economics*, 105(3), 836-860.